QUARTERLY SUMMARY

OF THE

IMPROVEMENTS AND DISCOVERIES

IN THE

MEDICAL SCIENCES.

ANATOMY AND PHYSIOLOGY.

1. *General Physiology of the Spinal Cord.*—The general tendency of the investigations of the last year has been to prove that the spinal cord is neither a mere collection of tracts of nerve-fibres nor a single nervous centre, but (if I may use the most popular language of the day) a collection or series of *central stations*, each of which has its own lines of nerve-fibres terminating in it, and serves to receive, and to transmit on numerous lines and in various directions, the impressions which are conveyed by the centripetal nerves abutting on it. The chief evidence for this, which, though not a new view, has hitherto been a very doubtful one, is as follows:

1st. Volkmann* has submitted the question whether the nerve-fibres of the spinal nerves remain and end in the cord, or go on to the brain, to the test of a kind of measurement. He weighed four pieces of a horse's spinal cord, each seven centimeters long, and taken respectively from below the 2d, the 8th, the 19th, and the 30th pairs of nerves. Their weights (in the order above named) were 219, 293, 163, and 281 grains; the areas of the transverse sections of the gray matter in them (in the same order) were 13, 28, 11, and 25 square lines; and those of the white matter 109, 142, 89, and 121 square lines. Thus, the quantity of white matter of the cord is absolutely less at the cervical than at the lowest part of the lumbar portion, and much less in the lower than in the upper cervical portion. The contrast was more marked in a comparison of the sum of the areas of transverse sections of all the spinal nerves of a serpent (Crotalus mutus) with that of a section of the upper part of the spinal cord. The former (purposely estimated below the truth) might be reckoned at ·0636 of a square inch; the latter only ·0058. The total size of the nerves, therefore, is at least eleven times greater than that of the cord—a difference which cannot be explained on the supposition that the nerve-fibres, when they pass into the cord, become smaller.

2d. The almost necessary deduction from these facts is that many or all the nerve-fibres terminate in or very near those regions of the cord into which they penetrate; and this is strongly confirmed by the observations of Hanover and Kölliker, already often referred to, both of whom have demonstrated the fine nerve-fibres as prolongations of the processes of some of the nerve-corpuscles of the gray matter of the cord.

3d. A step further is made by the remarkable observations of Volkmann, which have determined at least two examples of small portions of the cord having absolute and uninfluenced control over the movements of parts, to which parts they are the true and sole nervous centres. I refer here to the governance of the rhythmical movements of the lymphatic hearts by the two definite portions of the cord, of which an account has been already given. The evidence is complete

* Wagner's Handwörterbuch der Physiologie, art. Nervenphysiologie.

that these portioos of the cord are as troly the nervous centres for tho two hearts as the portion of the medulla ohlongata is for the respiratory movements.

4th. Something of the same kind as this iofluence of the cord on the lymphatic bearts is indicated by ao observation of Budge.* If a piece of tbe cord of n frog scarcely two lines wide, be removed from tbe place at which the great bracbial nerve goes off, it constantly occurs that the pulse of the heart decreases in frequency within two bours after the operation, and this does not happen when all the rest of the cord below this portion is removed.

Bot if it he thus proved that there ore in tbe spinal cord many central stations, the question still remains, how an impression is conveyed from one to the other, or from any of them to the brain?† It is evident, that there ore other modes of conveyanco besides that through the contiouous course of the fibres first impressed; it is not certain that any fibres pass uninterruptedly from the peripbery to the brain, yet the impressions are precisely cooveyed both to and from the hrain; and there is no support io all these facts for the erroneous experiments of Van Deen,‡ whicb would have made it appear tbat not only the nerve-fibres, but tho impressioos olso, stop sbort in or near the part of the cord on which they fall. Some of his morc correct experiments show that even a small length of the gray motter left in the cord, when all aroand it is cut awoy, is sufficient for tho conveyance of impressions up tho cord of the frog, but bow the conveyance is effected is as yet a questioo.—Paget's *Report* in *B. & F. Med. Rev.*, July, 1846.

2. *Theory of Cell-Development.*—A very lucid exposition of this tbeory, and of the principal facts concerning tho history and nature of tho nucleated cell in the structores of ooimals, bas been published hy Kölliker.§ The subject bas also been thoroughly discussed by Reichert‖ io his "Report on the Progress of Microscopic Anatomy in 1843," his observotions heing inclnded in an examination of essays hy Karsten,¶ Kölliker,** and Nägeli.†† The general tendency of the whole is to show that we nre yet very far from the knowledge of the true mode of development of the nucleated cell in animals. There is indeed in all these essays, as well as in the personal knowledge of most anatomists, an ahundance of facts bearing upon the subject; but maoy, perhaps tbe majority, of these facts caonot bo brougbt witbin the expressions of Scbwann's theory of cell-development; neither cao there be yet traced in them any single, uniform, and constant mode of development of the nucleated cell. From the very nature of the case, it seems most probable that one law and one mode mnst ho nlways observed in tbe developmeot of the cell and its parts; if it be so, the one modo is unknown; if it bc not so, then, in the place of the fair and comprehensive system of Schwaon we have a crowd of unconnected facts such as no memory can contain, and of which it would he useless, even if it were possiblc, to give a brief report.

The observatioos of Reichert, as well as those in the otber works just referred to, relato only, or principally, to the genesis of the nucleated cell and its several parts; and be implies that there is much less room for doubt concerning the metamorphoses of tbe cell itself, by which, of it or throngb it, all the moro highly organized animal tissoes are supposed to be formed. It oppears to me, however, that we can be as little sore of many of the changes which nucleated cells are said to pass throogb in tbe formation of other tissues, as we are of the process by whicb the cells themselves oro formed. The development of all the fibrous tissues appears especially doubtful. For the iovestigatioos of every year show tho

* Oesterr. Medic. Wochenschr., 10 Jan., 1846; from Froriep's Noitzen, 1845, No. 783.

† Hypotheses have been soggested in the year just passed by Drs. Todd aod Volkmaon, (l. c.), hut they hoth seem to me insufficieot for the facts.

‡ See last Report, p. 50, and Report for 1842–3, p. 20.

§ Io Schleiden and Nägeli's Zeitschrift, Heft ii., 1845; aoother part is aoooooced for poblication, hot I have oot beeo able to obtaio it.

‖ In Müller's Archiv., 1844, No. vi. Jahresbericht, pp. 148–172.

¶ De Cella Vitali; Berol., 1843. See last Report.

** Entwickelongsgeschichte der Cephalopoden: Zorich, 1844.

†† Zor Entwickelongsgeschichte des Pollens; Zorich, 1842; aod in Schleideo aod Nägeli's Zeitschrift für Botanik, 1844, Heft i.

great difficulty or impossibility of confirming the observations by which Schwann explained the development of these and some other tissues, and the equal facility of finding appearances which cannot be reconciled with his theory, or any other single theory yet proposed concerning it.*

I have found ample reason for expressing these doubts of the sufficiency of the accepted theories of development in recent examinations of tumours and other morbid growths. Their structure seems peculiarly adapted for testing a theory of cell-development; for they are, doubtless, obedient to the same general laws of formation as the healthy structures are, and, in the unequal and often rapid growth of their several parts, it could hardly happen but that in many specimens all the phases would be seen through which their structures pass towards their fully developed state. But in very numerous examinations I have not found a single example in which a cell has appeared to be forming or formed around a pre-existing nucleus; or one in which fibres have appeared to be formed out of nucleated cells; or one in which nucleated cells have appeared to constitute a stage towards any form of higher development. On the contrary, I have found many instances of rapidly growing structures composed of large collections of fibres without a nucleated cell among or near them: others with abundant nucleated cells, but scarcely any free nuclei or granules, and nothing like a cell incompletely developed round its nucleus; and, again, others (and these of especially rapid growth) with no cells at all, but composed almost entirely of corpuscles like nuclei or cytoblasts.

From these and other observations I am disposed to think that the ordinary (and not the exceptional) mode of development of fibres is, not through nucleated cells, but from a structureless or dimly granular substance which is first *marked*, and then broken up, into fibres. There is good evidence that the cytoblasts which are usually or always imbedded in this substance, influence the development of the fibres; and though I cannot tell how they do so, yet it is certainly not by conversion of themselves into fibres; they shrivel and disappear as the fibres increase and become more perfectly formed.

I think it will be found that, in morbid growths, the nucleated cell is always a terminal, not a transitional, form; for in certain tumours in which the best formed nucleated cells are found, e.g. the epithelial tumours and some examples of medullary cancers, there are no higher forms found, not even imperfect fibro-cellular tissue, except in small quantity about the blood-vessels. Corpuscles having the characters of nuclei or cytoblasts (to adopt still the usual names) appear to be the really energetic bodies in the growth and determination of these morbid structures; they are found in some tumours so abundantly, and so unmixed with nucleated cells, that their power of multiplying and assimilating cannot be doubted; and it is in some of these tumours also that, apparently under the influence of the cytoblasts, the most perfect fibro-cellular tissue is ultimately formed. What I have seen also of the development of these cytoblasts, leads me to agree with that view of the development of nuclei generally, according to which they are described as formed, not on a pre-existent nucleolus, but out of granules collected in a dark or dim mass of the proper size and shape, which then clears up by the formation of a membranous wall and transparent fluid contents with, in some cases, one or more persistent granules holding the position of nucleoli.—Paget's *Report* in *B. and F. Med. Rev.*, July, 1846.

3. *Digestive Powers of the Stomach.*—An account of the condition of the internal surface of the stomach under various circumstances, derived from examining this organ by means of M. Blondlot's method, which consisted in maintaining for a considerable time an artificial opening into the stomach of a dog, has been published by M. Bennanu.† This account is not much more than a repetition of the results obtained and made known by M. Blondlot,‡ most of which, as well as the facts

* A good evidence of this is in the fact that the most original observers, when they speak of the development of the tissues, almost always cease for the time to be original, and copy both the words and drawings of Schwann or Valentin.

† Archiv. d'Anat. Gén. et de Physiol. Janvier, 1846, p. 3.

‡ Traité Anal. de la Digestion, 8vo., Paris, 1844.

stated by Dr. Beaumont, are here confirmed. Thus, M. Bernard found that during fasting the mucous membrane of the stomach is pallid, folded on itself, contains but little blood, and is coated with a thin layer of neutral or slightly alkaline mucus; but directly upon the introduction of any foreign matters, especially digestible ones, into the stomach, its mucous membrane becomes turgid with blood, assumes a more marked degree of sensibility, and the layer of mucus is detached, being displaced by an abundant flow of acid gastric fluid; at the same time manifest movement of the stomach itself takes place. This flow of gastric or digestive fluid, which only takes place when its secretion is solicited by the presence of food, or of some mechanical or chemical irritation, may be influenced by many circumstances. Thus M. Bernard found that although, as was observed by Blondlot, a slight mechanical irritation applied directly to the mucous surface of the stomach excites at once an abundant flow of gastric fluid, yet if this irritation be carried beyond certain limits, so as to produce pain, the secretion, instead of being more abundant, diminishes or ceases entirely, while a ropy mucus is poured out instead, and the movements of the stomach are considerably increased; the animal, at the same time, appears ill at ease, is agitated, has nausea, and, if the irritation be continued, actual vomiting. Bernard has often, in such cases, observed bile flow into the stomach, and escape through the fistulous opening. He has also found similar disorders of the functions of the stomach to result from violent pain in other parts of the body; the process of digestion in such cases being suspended, and sometimes vomiting excited. When acidulated substances, as food rendered acid by the addition of a little vinegar, were introduced into the stomach, the quantity of gastric fluid poured out was much smaller, and the digestive process consequently slower, than when similar food, rendered alkaline by a weak solution of carbonate of soda, was introduced; this effect of alkalies in increasing the secretion of gastric fluid was noticed also by M. Blondlot. If, however, instead of a weak alkaline solution, carbonate of soda, in crystal or in powder, was introduced into the stomach, a large quantity of mucus and bile, instead of gastric fluid, flowed into the stomach, and very often was succeeded by vomiting and purging. When very cold water or small pieces of ice were introduced into the stomach the mucous membrane was at first rendered very pallid, but soon a kind of reaction followed, the membrane become turgid with blood, and a large quantity of gastric fluid was secreted. If, however, too much ice was employed, the animal appeared ill, shivered, and digestion, instead of being rendered more active, was retarded. Moderate heat applied to the mucous surface of the stomach seemed to have no particular action on digestion, but a high degree of heat produced most fatal effects; thus the introduction of a little boiling water threw the animal at once into a kind of adynamic state, which was followed by death in three or four hours; the mucous membrane of the stomach was found red and swollen, whilst an abundant exudation of blackish blood had taken place into the cavity of the organ. Like injurious effects, to a greater or less degree, followed an introduction of other irritants, such as nitrate of silver or ammonia, the digestive functions being at once abolished, and the mucous surface of the organ rendered highly sensitive.—KIRKE'S *Report* in *Ranking's Abstracts*, vol. iii.

4. *Absorption of Narcotic Substances by the Lymphatics.*—It has been stated by Emmert, Behr, and others, from the results of experiments, that the lymphatic vessels either do not absorb narcotic poisons at all, or to so slight an extent, that no poisonous effects are produced. Henle explains this by considering that narcotic substances in solution are certainly received into the lymphatics by the process of endosmose, but that the walls of the vessels are at once paralyzed thereby, and rendered unable to propel the poisonous solution onwards. BISCHOFF,* however, has recently performed some experiments on dogs, the results of which would seem to show that narcotic poisons are really taken up by the lymphatics, conveyed by them into the blood, and exert their poisonous effects on the system. Having tied the abdominal aorta below the origin of the renal artery, he inserted into a wound of the leg a strong solution formed of equal parts of nitrate of

* Schmidt's Jahrbucher, No. iv. 1846, p. 6.

strychnia and ferro-cyanide of potassium; in half an hoor symptoms of narcotism eosued, and the aoimal died shortly after in a state of tetanus. Ferro-cyanide of potassium was detected io the urine, in the clear watery lymph obtained from the lymphatics between the wound and the aorta, but not in the blood. This experiment proves tbat ferro-cyanide of potassium, even though contained in a solution with strychnia, may be absorbed by the lympbatics, conveyed by them ioto the blood, and eliminated by the kidneys; that the strychnia itself must also bave been absorbed by the lymphatics, unless we can suppose it to have got into the blood through some collateral circulation after tying the aorta: and that a substance may bo foond in the urioe, although it cannot be detected in the blood.—*Ibid.*

5. *Minute Anatomy of the Kidneys.*—The minoto anatomy of the kidney has received considerable attention during the last few months, and the result is the appearance of several interesting papers on the subject. The most important of these is one by Dr. Bioder,* of Dorpat. Having examined the kidneys of tritons, (which animals are especially well adapted to the investigation, inasmuch as from the natural form of the kidney they can be examined at once by the microscope, without undergoing any artificial preparation, which generally destroys the natural arrangemeot of parts,) he has obtained results which on the whole confirm the accuracy of Mr. Bowman's observations, although they differ in one important particular. According to Mr. Bowman's account the tuft of vessels composing each Malpighian body lies free and uncovered within the cavity of the dilated extremity of the urinary tubule, which forms a kind of capsule to it; Bidder, however, states that the tuft of vessels is in reality quite external to the cavity, being separated from it by the tunica propria of the dilated extremity of the urinary tubule; this membrane, therefore, according to him, is not perforated by the artery and vein supplying the tuft, as stated by Mr. Bowman, but by its external surface reflected over the tuft which projects ioto the cavity of the tubole, carrying the membrane before it, just as an organ (say the heart), envered on its external surface by serous membrane, projects into the cavity of the serous sac (or pericardium). The Malpighian tuft, thus invested, occupies sometimes half, sometimes much less, of the cavity of the dilated portion of the tubule, and at first sight appears exactly as if lying free and uncovered within it, but that it is really external to the cavity (at least in tritons) Bidder quite convinced himself, and he states that he has sometimes succeeded in separating the vascular tuft from the extremity of the urinary tubule, yet without the cavity of the latter being opened, or any of its fluid granular contents escaping. He says that one-third or one-half of the internal surface, as well as the neck of the capsule, bears ciliary epithelium (as noticed by Bowman in the kidneys of frogs), and that the remainder of the cavity is lined by a layer of fine tesselated epithelium, the cells of which have a tolerably regular polygonal form. Although commonly each tubule is in relation with its own toft, yet sometimes one tuft is common to two tubules, or, what Bidder seems to think more probable, the dilated part where the tuft comes into relation with the tubules, is not the joint extremities of two, but a pouch-like dilatation at the side of one tubule; he thus, to a certain extent, confirms the observations of Gerlach† on this point.

Ludwig‡ having also examined the minute anatomy of the kidney in many mammalia and amphibia, observes that the mode of termination of the urinary tubules described by Bowman may be very distinctly seen in the kidney of the coluber, and that in the other amphibia examined by him, and in mammalia, such an arrangement of the terminal extremities of the tubules appeared probable, though he was not able clearly to make it out; whilst in some few it did not seem to exist.

The subject has also received a valuable contribution from Kölliker,§ who details the results of his examinations of the kidneys of fœtal lizards. He confirms Bowman's account so far as concerns the structure of the urinary tubules, and the

* Müller's Archiv, Heft v., 1845.
† Last Report, p. 308.
‡ Wagner's Handwörterbuch der Physiologie, art. "Niereo," p. 630.
§ Müller's Archiv., No. 5, 1845.

elose connection between the extremities of these tubules and the Malpighian bodies, yet he agrees with Bidder, Gerlach, and others, in denying that these vascular tufts lie bare within the cavity of the dilated portion of the tubules. Although he does not recognize the existence of the membranous partition between the tuft and the cavity, described by Bidder, yet he states that the cavity is freely lined, as also is the surface of the vascular tuft covered, by an abundance of epithelium, so that the tuft lies embedded in a mass of epithelial cells (as described by Gerlach).* He mentions that in the kidneys of the animals (lizards) which he examined, ciliary epithelium, in a state of active movement, was present along the whole length of the urinary tubules, with the exception of at their exit from the gland, and just where they dilated into their terminal extremities within the substance of the organ.†—*Ibid.*

6. *Absence of Corpus Callosum.*—M. PAGET has communicated to the Med. Chirurg. Society, the details of a case in which the middle portion of the fornix and the whole of the septum lucidum were absent, and in which, in place of the corpus callosum, there was only a thin fasciculated layer of white nervous matter, 1-4 inch in length, but of which the fibres extended into all those parts of the brain into which those of the healthy corpus callosum can be traced. Behind the imperfect corpus callosum, the optic thalami, the middle commissure (which was very large), the posterior commissure, and the pineal gland lay exposed after removal of the velum. The lateral parts of the fornix and the rest of the brain were quite healthy. The patient was a servant girl who died of pericarditis. She had displayed during life nothing very remarkable in her mental condition beyond a peculiar want of forethought and power of judging of the probable event of things. Her memory was good, and she possessed as much ordinary knowledge as is commonly acquired by persons in her rank of life. She was of good moral character, trustworthy, and fully competent to all the duties of her station, although somewhat heedless; her temper was good, and disposition cheerful. From these facts Mr. Paget is inclined to regard the functions of the corpus callosum as connected with the highest operations of the mind, especially as in the few cases in which it has been found deficient, or altogether absent, the mind has possessed a moderate average power and capacity for knowledge, and all the lower functions of the nervous system have been perfectly discharged.—*Ibid.*

ORGANIC CHEMISTRY.

7. *Presence of Copper and Lead in the Bile.*—Last year Bentozzi made the discovery that copper is contained, in a tolerably large amount, in brown biliary calculi; he was never able, however, to detect this metal in the bile itself. By the announcement of Bentozzi's discovery HELLER was induced to pay attention to the subject, and after a careful examination was led to a similar conclusion; namely, that the coloured biliary calculi contain a large amount of copper.‡ The method adopted by Heller for the detection of copper was more simple than the one employed by Bentozzi. Heller directs several of the darkest calculi to be rubbed together into a rather coarse powder, and then burned in a platinum crucible previous to the addition of nitric acid. The ash of the combustion is to be treated with a little nitric acid to remove any remains of carbon, then dissolved in water acidulated with nitric acid, neutralized, and finally tested for copper by the ordinary reagents.

* Last Report, p. 309.

† The high interest of the above papers must be the excuse for the length at which they have been noticed. They contain much other valuable matter, which it did not appear necessary to notice here, but which will well repay a careful perusal. [Since the above was written, M. Hyrtl, in a strange paper on the "Physiology of the Urinary Secretion," (translated in the Medical Times, April 4, 1846,) denies absolutely the existence of any connection between the Malpighian body or the capsule covering it, and the extremity or any part of the urinary tubule.]

‡ Arebiv. fur Chemie und Mikroscopie, vol. ii. p. 238.